



Director's Rule 9-2011

Applicant: City of Seattle Department of Planning and Development	Page 1 of 7	Supersedes: NA
	Publication:	Effective:
Subject: HEIGHT MEASUREMENT: CALCULATING AVERAGE GRADE LEVEL	Code and Section Reference: SMC 23.86.006.A	
	Type of Rule: Code Interpretation and procedural rule	
	Ordinance Authority: SMC 3.06.040	
Index: Zoning/Land Use Procedural Requirements	Approved _____ Diane M. Sugimura, Director, DPD	Date

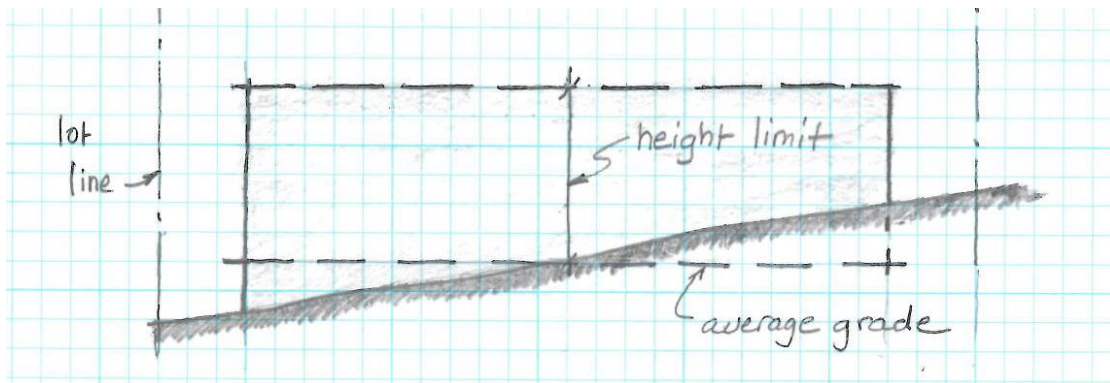
BACKGROUND:

Pursuant to City of Seattle Municipal Code (SMC) Section 23.86.006, structure height is measured from average grade in all zones except Downtown zones and zones in the South Lake Union Urban Center, and except for the Living Building Pilot Program authorized by Section 23.40.060. The Code allows for a general measurement technique (23.86.006.A.1) to determine average grade level, and an option for the applicant (23.86.006.A.2) that allows the average grade level to be calculated for multiple sections of a structure that the applicant can choose to use to encourage buildings to better follow the topography. There are two formulas that may be used at the applicant's option within the general technique.

General Rule - Calculating Average Grade Level for Height Measurement

Pursuant to 23.86.006.A.1, the general rule allows two formulas for calculating average grade level. Formula 1 calculates the average elevation of the topography, prior to any development activity, based on the elevations of existing grade at the center of each exterior wall. Formula 2 uses the average elevations at the midpoints of the sides of the smallest rectangle that can be drawn to enclose the structure. The measurement under both formulas includes decks and porches, unless the deck or porch has no walls at or below the deck level and no covering above the deck or porch, as well as cantilevered portions of a structure which enclose interior space.

If there are multiple structures on a lot, the average grade elevation is calculated separately for each structure. For structures that contain attached but otherwise independent building units, such as rowhouses or townhouses, the average grade level is calculated separately for each unit. Also, to better address topographic conditions on a lot, an alternative method can be used to divide a larger structure into smaller sections, and the average grade level can be calculated for each of those sections of the structure.



Formula 1: Exterior Walls. Under this formula, the average grade level is calculated as the average of the elevation of existing lot grades at the midpoints, measured horizontally, of each exterior wall of the structure enclosing occupied floor area.

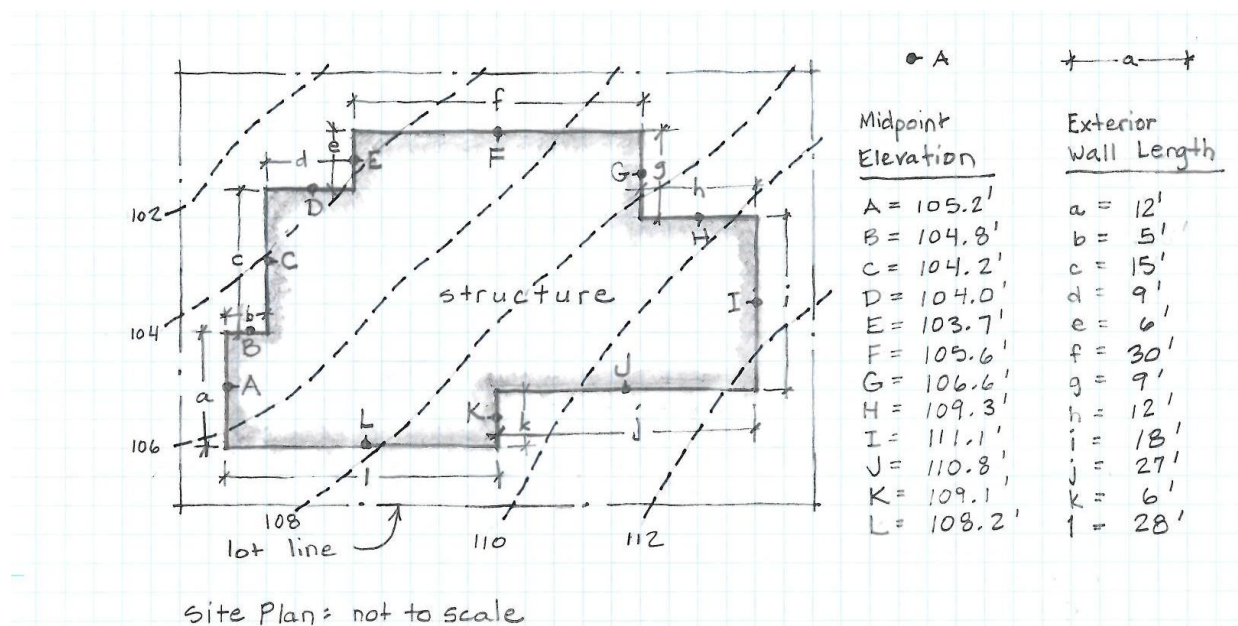
$$\text{Formula 1: } \frac{(\text{midpoint grade elevations}) \times (\text{exterior wall length})}{(\text{total length of each exterior wall})}$$

Example applying general rule to calculate average grade level

A, B, C, D....Existing ground elevation at midpoint of exterior wall

a, b, c, d.....Horizontal length of exterior wall*

*include the perimeter of a deck, unless the deck has no walls at or below the deck level and no covering above the deck



Formula:
$$\frac{(A \times a) + (B \times b) + (C \times c) + (D \times d) + (E \times e) + (F \times f) + (G \times g) + (H \times h) + (J \times j) + (K \times k) + (L \times l) + \dots}{a + b + c + d + e + f + g + h + i + j + k + l + \dots}$$

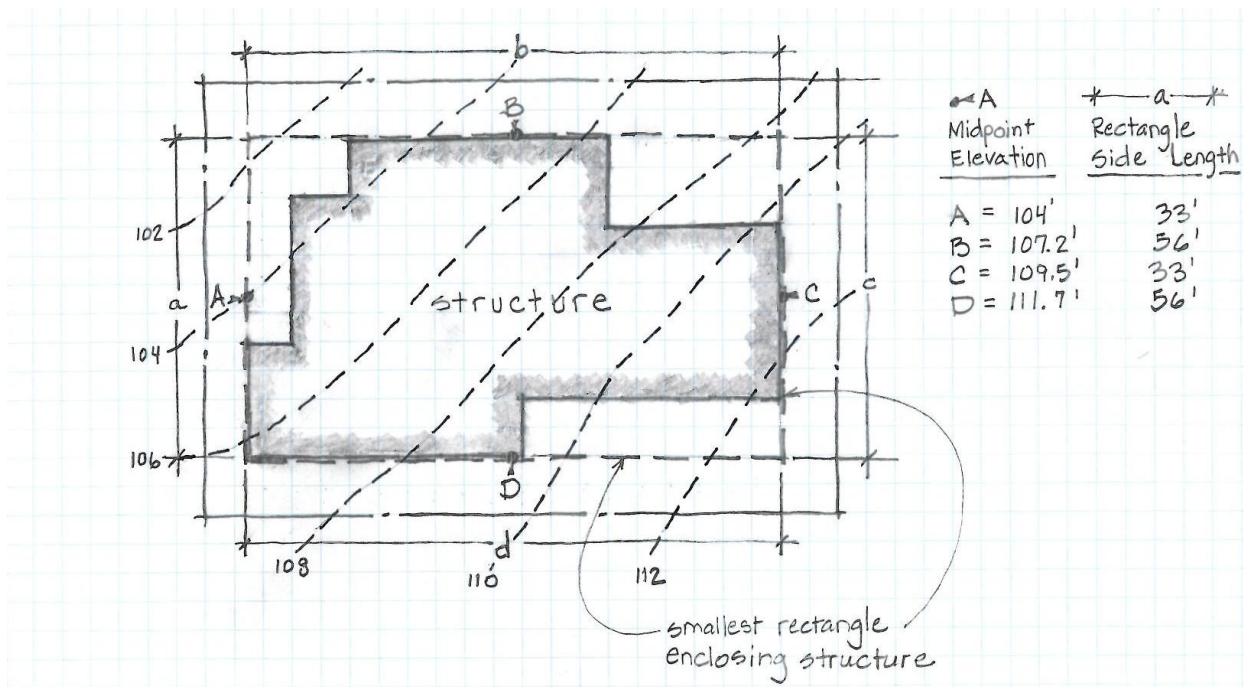
Example:

$$\frac{(105.2 \times 12) + (104.8 \times 5) + (104.2 \times 15) + (104.0 \times 9) + (103.7 \times 6) + (105.6 \times 30) + (106.6 \times 9) + (109.3 \times 12) + (111.1 \times 18) + (110.8 \times 27) + (109.1 \times 6) + (108.2 \times 28)}{12 + 5 + 15 + 9 + 6 + 30 + 9 + 12 + 18 + 27 + 6 + 28} =$$

$$\frac{19,022.2}{177} = 107.47' \text{ average grade level}$$

Formula 2: Enclosing Rectangle. Under this formula, the average grade level is calculated by first drawing the smallest rectangle that encloses the entire structure, including all occupied floor area. The average grade level is calculated as the average of the elevation of existing lot grades at the midpoints, measured horizontally, of each side of this rectangle.

Formula 2:
$$\frac{(\text{midpoint grade elevations}) \times (\text{rectangle side lengths})}{(\text{total length of rectangle sides})}$$



Formula:
$$\frac{(A \times a) + (B \times b) + (C \times c) + (D \times d)}{a + b + c + d}$$

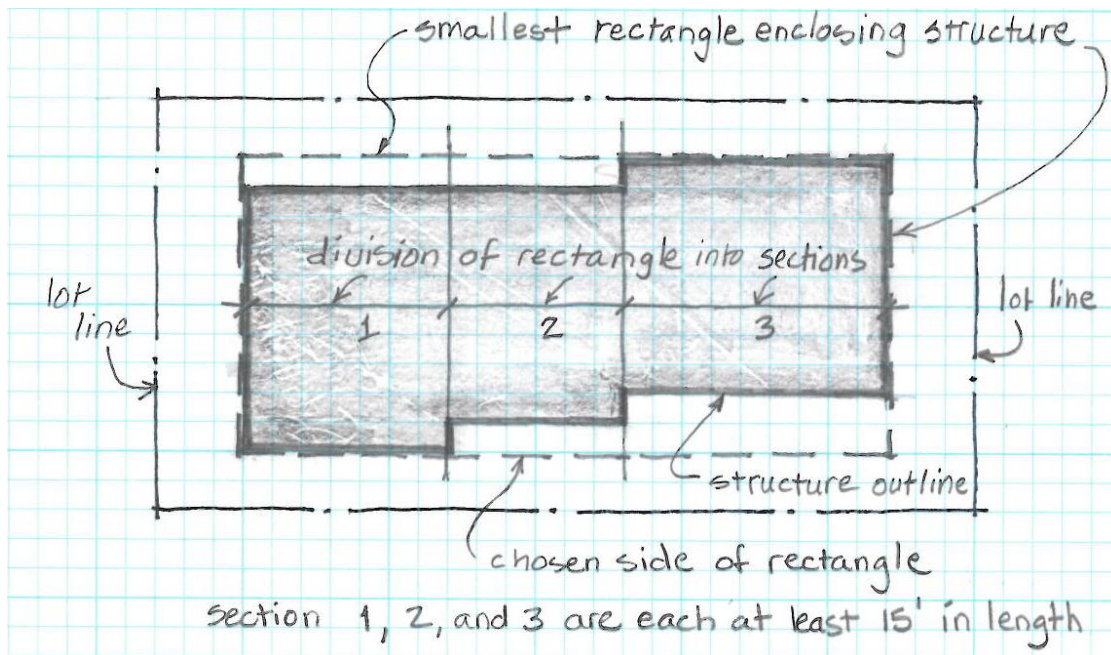
Example:
$$\frac{(104 \times 33) + (107.2 \times 56) + (109.5 \times 33) + (111.7 \times 56)}{33 + 56 + 33 + 56} =$$

$$\frac{3,432 + 6,003.2 + 3,613.5 + 6,255.2}{178} = \frac{19,303.9}{178} = 108.45 \text{ average grade level}$$

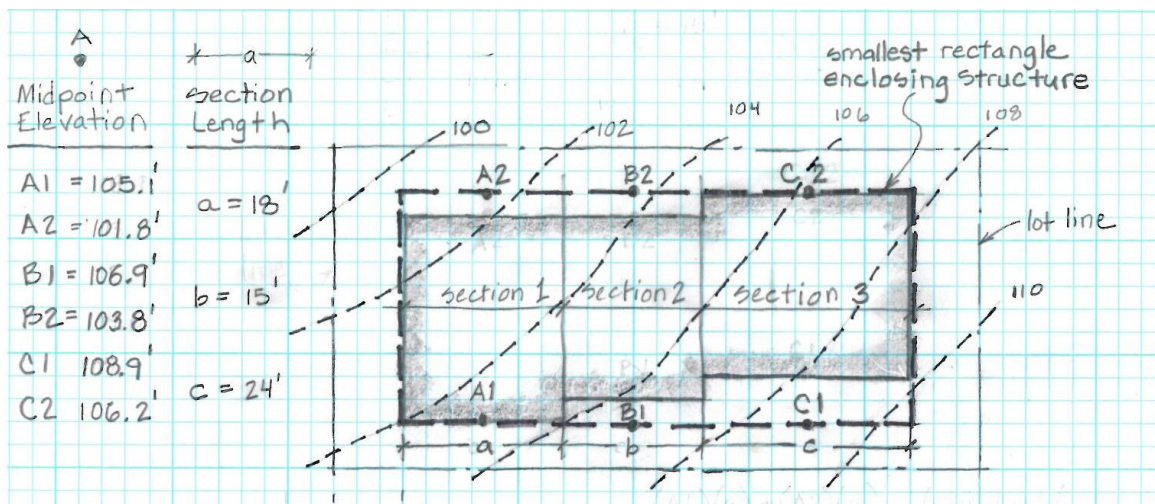
Option to the General Rule

Pursuant to 23.86.006.A.2, an option may be used determine average grade level, generally to allow structures to better respond to the topography of sloping sites. In general, the intent is to allow a large structure to adjust the points at which height is measured so that portions of the structure can “step up” with the slope. The technique basically allows the structure to be divided into sections that are treated similar to separate structures for the purposes of calculating the average grade level used to measure height.

Similar to the approach in Formula 2 under the General Rule, the first step is to draw the smallest rectangle that encloses the entire structure, including all occupied floor area. Next, chose one side of the rectangle (usually a side that is generally parallel to the direction of the slope). Along this side of the rectangle, divide the rectangle into sections that are at least 15 feet in length. The lines dividing the rectangle into sections are to be perpendicular to the chosen side, and are to extend across the width of the structure, parallel to each other and to the opposing ends of the rectangle.



The average grade level for each section of the structure is calculated as the average elevation of existing lot grades at the midpoints of the two opposing sides of each section of the rectangle enclosing the structure, as shown below:



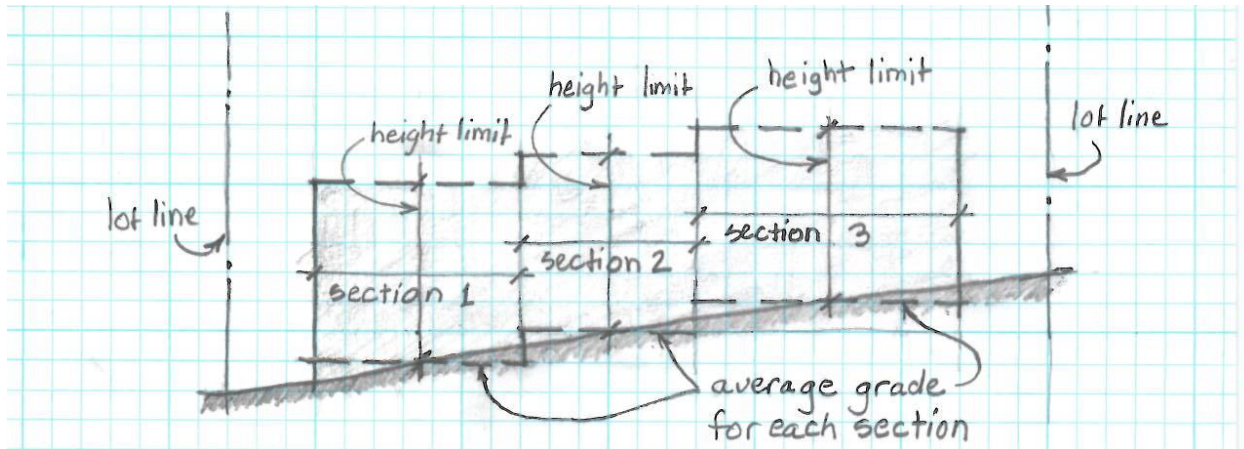
Average grade level

$$\text{Section 1: } \frac{(A1 \times a) + (A2 \times a)}{a + a} = \frac{(105.1 \times 18) + (101.8 \times 18)}{18 + 18} = \frac{1,891.8 + 1,832.4}{36} = \frac{3,724.2}{36} = 103.45$$

$$\text{Section 2: } \frac{(B1 \times b) + (B2 \times b)}{b + b} = \frac{(106.9 \times 15) + (103.8 \times 15)}{15 + 15} = \frac{1,603.5 + 1,557}{30} = \frac{3,160.5}{30} = 105.35$$

$$\text{Section 3: } \frac{(C1 \times c) + (C2 \times c)}{c + c} = \frac{(108.9 \times 24) + (106.2 \times 24)}{24 + 24} = \frac{2,613.6 + 2,548.8}{48} = \frac{5,162.4}{48} = 107.55$$

Once the average grade level has been calculated for each portion of the structure, the height for that portion can be measured up from that average grade level (see exhibit below).



Required topographic survey

For all measurement options, a topographic survey from a licensed land surveyor will be required when existing grade will be disturbed to accomplish construction of the proposal and when any exterior wall of the new structure, in the area where grade is being disturbed, is within 2' of the allowed height limit for the structure as measured above existing grade.

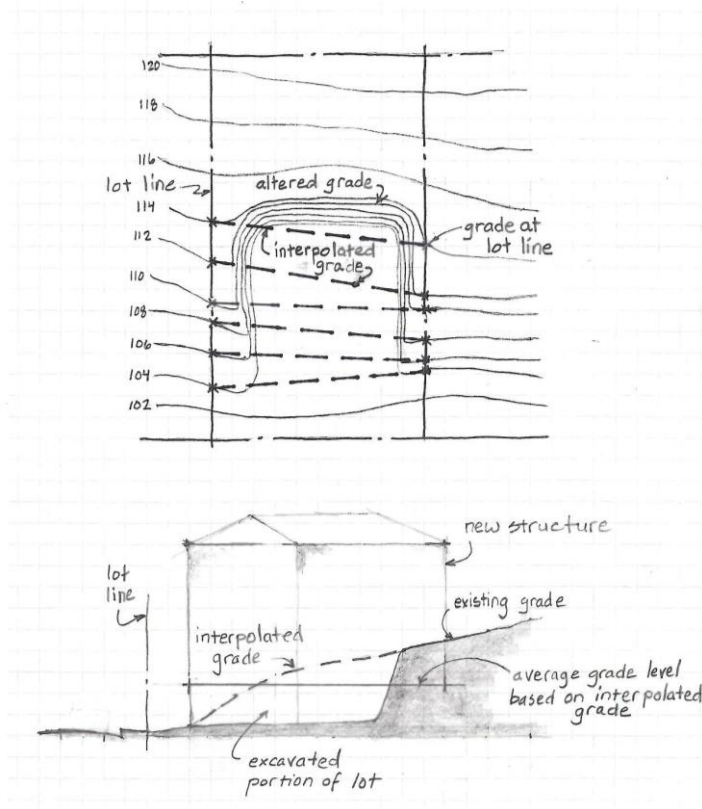
Topographic information may be provided by either:

- Showing 2 foot contours across the entire site; or,
- Specifying the existing grade elevations at each corner of the site, each building corner, and at the midpoint elevations that are used in the average grade height calculation method used by the applicant.

Interpolated grade

On a lot where the surface contour has been altered as a result of past excavation, the Code allows the average grade level to be calculated by using an interpolated grade, so that future development on the excavated lot relates to the topography in a manner that is more consistent with development on abutting lots.

To determine the interpolated grade, the existing grade elevations, measured along an abutting lot line, are extended across the subject lot in as a straight line to connect with the matching grade elevation along the nearest abutting lot line intersecting the contour line. The average grade level is then calculated as if this interpolated grade was the natural surface contour.



After the lot is developed, the grade must be restored from the lot lines used to establish the interpolated grade to the exterior walls of the building(s), following the general slope of the interpolated grade.

